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ABSTRACT

Researchers investigating the cerebral information processing of visual stimuli have usually followed the pattern of stimulating the subject's eyes with light and observing accompanying changes in brain wave patterns. Such visually evoked responses (VERs) have been found to discriminate bright from dull children and dyslexic from normal readers. Research in this area has also shown that "familial reading dysfunction" subjects (those who are retarded in reading even though they are normal in other respects) have an inverted right occipital lobe VER with respect to their posterior midline VER. A study was conducted to determine if children with inverted VERs were different from children with normal VERs with respect to the types of errors made in recognizing isolated words. Subjects, 20 inverted VER children and 11 normal VER children, completed a number of tests designed to measure listening comprehension, intelligence, word recognition, and oral and silent reading ability. Results showed that the inverted VER children made more omissions and irrelevant substitutions while recognizing isolated words than did the normal VER children. In addition, the normal VER children substituted significantly more words with the same beginning letter or sounds, suggesting that they were more systematic in their word attack procedures. (FL)

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The Electrophysicology of Oral Reading Errors

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Cerebral information processing of visual stimuli has been the subject of several investigations. These investigations have usually followed the pattern of stimulating the eyes with light and observing accompany changes in brain wave patterns. Such visual evoked responses (VER) have been found to discriminate certain educational groups such as bring from dull children and dyslexic from normal children. Rhodes, Dustman, and Beck (1969) found that VERs discriminated bright from dull children. Buchsbaum and Fedio (1969) reported that when words and designs were presented as stimuli, there was a difference in average evoked responses between the right and left hemisphere. Faure et al. (1967) noted some differences in latencies in VER between "dyslexic" and "normal" children. Childers et al. (1970) found that inverted or out-of-phase VERs distinguished "familial reading dysfunction." Apparently VERs also have some specificity for the type of stimulus used since Buchsbaum and Fedio (1969) were able to demonstrate that word and design average evoked responses were different in the left hemisphere.

Since the present study is closely related to the earlier work of Childers et al. (1970), a brief review of those procedures will be helpful. As a matterof interest their subsequent research has involved the more elaborate techniques described by Ross, Childers, and Perry (1973). They monitored by scalp electrodes the cortical activity evoked by red and green light

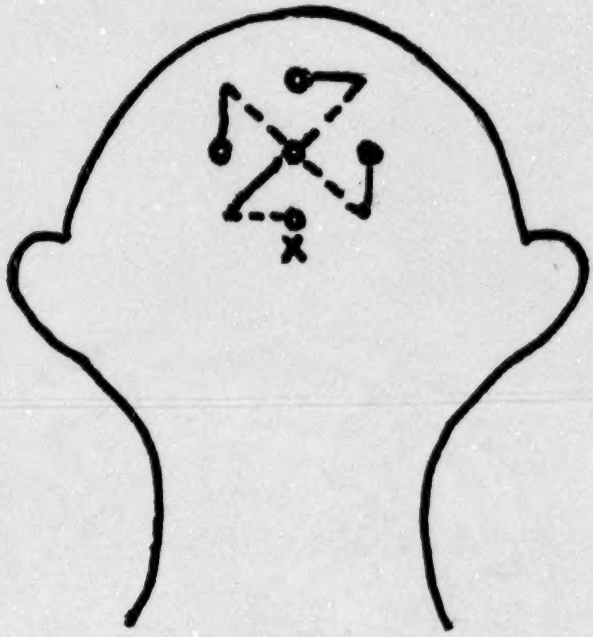
presented both binocularly and dichoptically (left eye red, right eye green). With electrodes in the configuration shown in Figure 1, bipolar recordings were simultaneously made from four cortical areas: posterior and anterior midline and left and right occipital lobes. In most cases three VERs were obtained for each child. Results of this procedure for studying cerebral processing among their subjects showed that a very high percentage of "familial reading dysfunction" patients had an inverted right occipital lobe VER with respect to their posterior midline VER.

All patients in their sample had been seen by an inter-disciplinary diagnostic team as described by Larsen et al. (1973). The label "familial reading dysfunction" was applied to children who were retarded in reading even though they were normal in IQ, neurological status, schooling, cultural opportunity, and psychiatric status. It was also a requirement that they had had one close relative in a previous generation with a similar reading problem. As noted above, the "familial reading dysfunction" patients also tended to have a VER inversion. That is their responses (brain wave) from the posterior mid-line were inverted or 180° out of phase with their right occipital lobe responses.

Comparison of the inverted VER patients with the normal VER patients was the concern of the present study. The two groups were compared on the basis of IQ, Reading Grade Levels,

Figure 1

Electrode Configuration



Bipolar recordings were made simultaneously from the electrode positions shown. For each electrode pair, the electrode represented by the solid line was taken to be active with respect to the electrode represented by the dashed line. The spacing between electrodes is 5 cm. The "X" marks the inion.

Listening Ability, and Oral Reading Errors to see whether they differed significantly. If it can be established that inverted VER patients have characteristic problems in word attack and recognition skills, reading diagnosis and instruction would be facilitated.

Method

Subjects

The subjects included 31 of those children in the Childers et al. report (1970). Of their original sample, 9 were rejected from the present study because the reading data were unavailable. Of the 31 remaining, 20 had been found to have inverted VERs as described above and 11 showed no inversion.

Thus both groups were composed of clinic patients who had been referred by physicians to an interdisciplinary diagnostic team because of suspected reading problems. Although the two groups were somewhat different in numerical size, it can be seen from Table I that they were fairly comparable in age, school grade, and number of siblings. Also, by comparing hospital codes it was determined that the two groups did not differ significantly in regard to family economic circumstances. There were no "culturally different" children in either group.

Procedure

All patients were given the Wechsler Intelligence Scale for Children (Wechsler, 1949) and the Diagnostic Reading Scales (Spache, 1963). In addition to word recognition, oral reading,

Table I

Background Data for Patients With and Without Inverted VERs

	Inverted VER (N=20)	Normal VER (N-11)
Average Age (months)	131.2	132.0
Average Grade	5.1	5.0
Average Number of Siblings	2.0	2.4
Median Hospital Code[a]	04	04

[a]A numerical code which indicates ability to pay. The median 04 would be considered professional or white collar level.

silent reading, and listening comprehension scores obtained from the Reading Scales, errors in recognizing words in isolation and during oral reading were noted. Mean differences between the two groups were obtained for each factor, and *t* test analyses conducted.

Results

Mean differences between the two groups and results of the *t* test analyses can be studied in Table II. It can be seen that there were no significant differences between the two groups in IQ or reading test scores. However, there were significant differences in errors made while recognizing words out of context. Inverted VER children substituted words with the same beginning letter or sound significantly less than normal VER children ($p < .05$). Also the inverted VER children substituted irrelevant words ($p < .05$) and omitted letters or word parts significantly more than normal VER children ($p < .05$). The two groups did not differ significantly on word recognition errors made while reading orally.

Discussion

Although some clear cut differences in recognizing words in isolation were found between the two groups compared, the limited size of the groups suggest caution in making generalizations. That the inverted VER group made more omissions and irrelevant substitutions while recognizing isolated words suggests that they could not or had not developed some of the

Table II

t Test Analyses of Mean IQ and Reading Skill Differences Between Inverted VER Patients and Normal VER Patients

	Mean for Inverted VER Patients	Mean for Normal VER Patients	Mean Difference and Significance
Wechsler Scores			
Verbal IQ	99	101	2.0
Performance IQ	106	105	-1.0
Full Scale IQ	103	103	0.0
Spache Reading Scales			
Grade Levels			
Word Recognition	4.1	4.6	0.5
Oral Reading	3.8	4.2	0.4
Silent Reading	4.6	4.3	-0.3
Listening Comprehension	6.6	6.5	-0.1
Word Recognition Errors			
Words in isolation			
Substitutions			
Similar configuration	1.5	2.6	1.1
Similar meaning	.2	.2	0.0
Same beginning sound or letter	1.9	4.5	2.6*
Irrelevant words	5.1	1.6	-3.5*
Omission of letters or word parts	2.0	.7	-1.3*
Words unknown	4.8	6.4	1.6
Oral reading			
Substitions			
Similar configuration	.7	.6	-0.1
Similar meaning	3.6	4.0	0.4
Same beginning sound or letter	.4	.5	0.1
Irrelevant word	3.6	2.3	-1.3
Omission of letters or word parts	3.8	2.6	-1.2
Additions	2.2	1.7	-0.5
Words unknown	9.5	10.7	1.2
Repetition of words	1.4	.8	- 0.6

*$p < .05$

necessary systematic word attack skills. Their difficulty with systematic word attack seems to be emphasized by the finding that the normal VER children substituted significantly more words with the same beginning letter or sounds. The normal VER children apparently had learned to be more systematic in word attack. The similarity of the two groups in word recognition errors during oral reading could mean that the inverted VER group were aided by context to compensate for their lack of systematic word skills.

Conclusion

Children who had been identified as having an inverted right occipital lobe VER with respect to their posterior midline VER were also significantly different from a control group with respect to certain types of errors made in recognizing isolated words. The tentative conclusion drawn is that inverted VER children had not or could not learn some of the basics of word attack skills. Further research is needed to determine whether these results can be replicated. If it can be established that inverted VER children do have special problems in learning word attack skills, research should also be undertaken to determine whether they could respond to special approaches to teaching.

References

BUCHSBAUM, M. and FEDIO, M. Visual information and evoked responses from the left and right hemispheres. Electroenceph. clin. Neurophysiol., 26, 266-272, 1969.

CHILDERS, D., ROSS, J., PERRY, N., Jr. and NEVIS, A. Dyslexia and cortical correlates. Paper presented at VIII ISCERG Symposium, Pisa (Italy), September 7-12, 1970. (Gainesville, Fla.: Visual Sciences Laboratory, University of Florida.)

FAURE, J., ROZIER, J., BENSCH, C., VINCENT, J., CORCELLE, L. and PORTMAN, M. Potentials Associatifs evoques par des stimulations combinees auditives et visuelles chez l'enfant amblyope fonctionnel strabique et chez l'enfant dyslexique. Societe d'Electroencept. Langue Francaise, Seance des 5 and 5, 503-512, 1967.

LARSEN, J., TILLMAN, C., ROSS, J., SATZ, P., CASSIN, B., and WOLKING, W. Facors in reading achievement: An interdisciplinary approach. Journal of Learning Disabilities, 1973, 6 (10), 636-644.

RHODES, L., DUSTMAN, R., and BECK, E. The visual evoked response: A comparison of bright and dull children. Electroenceph. clin. Neurophysiol., 27, 364-372, 1969.

ROSS, J., CHILDERS, D., and PERRY, N., Jr. The natural history and electrophysiological characteristics of familial language dysfunction. In P. Satz and J. J. Ross (eds.), The disabled learner, Rotterdam University Press, 1973, Chapter 7, pp. 149-174.